

# Implementation Of Alaris Guardrails® For The Prevention Of Infusion Related Medication Errors

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## Introduction

- In recent years, there have been many technological advances in IV Medication Safety
  - Guardrails Software
    - IV Drug Information Library prevents dose-related IV medication errors
  - CQI Software
    - Records "Near Miss" IV medication error events
- Studies indicate that there are 1.1 potentially life-threatening and 1.5 probably significant IV medication errors prevented per every 1,000 patient days with smart pumps<sup>1</sup>

## Purpose

- The primary objective of this project was to implement Guardrails® at TJUH to prevent infusion related errors
- Secondary objectives included:
  - Assess compliance with use of Guardrails®
  - Apply IV Medication Harm Index to TJUH institutional data from Alaris Guardrails Software
  - Determine frequency and potential clinical severity of "Near Miss" IV medication errors

## Methodology

- Developed data sets
  - Identified all continuous infusion medications
  - Obtained feedback on dosing limits from physicians, pharmacists, nurses, standardized doses already in place, and references
  - Placed medication into appropriate profile(s) (critical care, med/surg, ICN, etc...)
  - Tall man lettering to enhance medication safety
    - i.e. DOPamine vs. DOBUTamine
- Obtained Pharmacy & Therapeutics (P&T) committee approval
  - Presented to respective multidisciplinary subcommittees and P&T committee
- Nurses tested "user friendliness" of pumps prior to implementation
- Implemented Guardrails®
  - Uploaded Guardrails® software with data set into approximately 1,000 pumps
- Assessed compliance
  - Performed audit to assess whether Guardrails® software is being used in appropriate situations (hospital policy requires use of Guardrails® when the drug is in the drug library)
- Obtained CQI data
  - Downloaded data from 154 IV pumps which detailed alerts and overrides
  - Phase One
    - Clinical interpretive analysis ("cleansing") of data downloaded from CQI software
  - Phase Two
    - Application of IV Medication Harm Index (clinical severity rating scale)<sup>2</sup>

### IV Medication Harm Index (Clinical Severity Rating Scale)

| Drug Risk       | Dose                       |                              |                         |
|-----------------|----------------------------|------------------------------|-------------------------|
|                 | Low overdosing range       | Moderate overdosing range    | High overdosing range   |
| <b>Low</b>      | 1 - 4 x maximum dose (1.5) | 4.1 - 9.9 x maximum dose (2) | >10 x maximum dose (3)  |
| <b>Moderate</b> | 1 - 2 x maximum dose (2)   | 2.1 - 4.9 x maximum dose (4) | >5 x maximum dose (6)   |
| <b>High</b>     | 1 - 1.5 x maximum dose (3) | 1.6 - 2.4 x maximum dose (6) | >2.5 x maximum dose (9) |

  

| Level of Care       | Description              | Score |
|---------------------|--------------------------|-------|
| General             | Medical, Surgical, Other | 1     |
| Adult ICU/Telemetry | ICU and telemetry beds   | 2     |
| PICU or NICU        | Peds ICU or Neonatal ICU | 3     |

  

| Detectability | Score |
|---------------|-------|
| Likely        | 1     |
| Unlikely      | 2     |

  

| IV Medication Harm Index Scale |
|--------------------------------|
| Summated Score Range = 3.5-14  |

## Results

- Compliance Audit
  - Initial audit conducted two weeks post-implementation
    - 91% of pumps were in correct profile
    - 60% of applicable infusions were using Guardrails®
  - The majority of instances in which Guardrails® was not used involved parenteral nutrition and electrolyte riders
- CQI data downloaded from a sample of 154 IV pumps
  - Total of 1534 events
- Data reviewed by Critical Care/Medical Clinical Nurse Specialists and Pharmacy Clinical Experts
- Idiosyncratic clinical practice applications removed
  - Bolusing of propofol, fentanyl, midazolam
  - Vasoactive Drug Titration
  - Weight-based furosemide dosing issues
- Total of 80 actual "Near Miss" events identified

### Medications with Highest Harm Score

| Drug               | Mean Harm Score | Standard Deviation (SD) | Range |
|--------------------|-----------------|-------------------------|-------|
| Fentanyl           | 13              | 0                       | 13-13 |
| Heparin            | 12.4            | 0.55                    | 12-13 |
| Eptifibatide       | 11.5            | 2.12                    | 10-13 |
| Insulin            | 11.05           | 1.75                    | 6-12  |
| Potassium Chloride | 10.29           | 2.2                     | 6-13  |
| Dopamine           | 8               | 1.41                    | 7-9   |
| Norepinephrine     | 8               | 1.41                    | 7-9   |
| Phenylephrine      | 7.8             | 1.1                     | 7-9   |
| Nesiritide         | 7               | 0                       | 7-7   |
| Epinephrine        | 6               | 1.41                    | 5-7   |

### Medications with Highest Frequency Score

| Drug               | Frequency Score |
|--------------------|-----------------|
| Insulin            | 23.75% (19/80)  |
| Potassium Chloride | 21.25% (17/80)  |
| Heparin            | 6.25% (5/80)    |
| Phenylephrine      | 6.25% (5/80)    |
| Eptifibatide       | 3.75% (3/80)    |
| Fentanyl           | 3.75% (3/80)    |
| Nesiritide         | 3.75% (3/80)    |
| Vancomycin         | 3.75% (3/80)    |

### Significant events prevented

| Medication         | Entered Amount | Resolution      |
|--------------------|----------------|-----------------|
| Potassium Chloride | 100 mEq/hr     | 10 mEq/hr       |
| Heparin            | 9000 unit/hr   | 900 unit/hr     |
| Phenylephrine      | 35 mcg/kg/min  | 3 mcg/kg/min    |
| TPN                | 1400 ml/hr     | 58 ml/hr        |
| Nesiritide         | 0.1 mcg/kg/min | 0.01 mcg/kg/min |
| Insulin            | 50 unit/hr     | 10 unit/hr      |

## Conclusion

- The use of smart pumps can greatly reduce the incidence of infusion related medication errors
- Systematic data provides opportunity for evidence-based educational interventions and practice applications
- Confirmation of high risk drugs as identified by The Joint Commission
- Verification of necessity for double checks of heparin and insulin

## Disclosures

The authors of this presentation have the following to disclose concerning possible financial or personal relationships with commercial entities that may have direct or indirect interest in the subject matter of this presentation:

- E. Fitzpatrick – Nothing to Disclose
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## References

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